

CLAIMS

What is claimed is:

1. A photomask for semiconductor photolithography processing comprising:
a non-dense contact; and
a plurality of assist features situated near and around the non-dense contact, each assist feature having a size smaller than a size of the non-dense contact,
the plurality of assist features improving at least one of depth of focus (DOF) and resolution of the semiconductor photolithography processing.
2. The photomask of claim 1, wherein the plurality of assist features consists of at least six and less than twelve assist features.
3. The photomask of claim 1, wherein the plurality of assist features consists of eight assist features.

4. The photomask of claim 1, wherein the plurality of assist features are situated in a symmetrical pattern near and around the non-dense contact, each assist feature equally distant from the non-dense contact.

5. The photomask of claim 1, wherein the size of each assist feature is between twenty and ninety percent of the size of the non-dense contact.

6. The photomask of claim 1, wherein the plurality of assist features are at least substantially identical to one another.

7. The photomask of claim 1, wherein each assist feature has a shape at least substantially similar to a shape of the non-dense contact.

8. The photomask of claim 1, wherein the non-dense contact is an isolated contact.

9. The photomask of claim 1, wherein the non-dense contact is a random contact.

10. The photomask of claim 1, wherein the non-dense contact is a semi-dense contact.

11. A method for producing a photomask comprising:

creating a non-dense contact on the photomask; and

creating a plurality of substantially identical assist features situated in at least a substantially regular pattern around the non-dense contact, each assist feature having a size smaller than a size of the non-dense contact,

such that the plurality of assist features allow the non-dense contact to at least more closely mimic a dense contact during off-axis illumination (OAI).

12. The method of claim 11, wherein the plurality of assist features consists of at least six and less than twelve assist features.

13. The method of claim 11, wherein the size of each assist feature is between twenty and eighty percent of the size of the non-dense contact.

14. The method of claim 11, wherein each assist feature has a shape at least substantially similar to a shape of the non-dense contact.

15. The method of claim 11, wherein the non-dense contact is one or more of an isolated contact, a random contact, and a semi-dense contact.

16. A semiconductor device formed at least in part by a method comprising:

positioning a photomask over a semiconductor wafer having a top layer of photoresist, the photomask having a plurality of substantially identical assist features situated in at least a substantially regular pattern around a non-dense contact, each assist feature having a size smaller than a size of the non-dense contact;

exposing the semiconductor wafer through the photomask positioned thereover, such that the top layer of photoresist includes exposed parts under clear parts of the photomask and unexposed parts under opaque parts of the photomask;

developing the semiconductor wafer to remove the exposed parts of the top layer of photoresist;

etching the semiconductor wafer where the wafer is revealed through the exposed parts of the top layer of photoresist that has been removed; and

removing the unexposed parts of the top layer of photoresist.

17. The semiconductor device of claim 16, wherein the plurality of assist features consists of at least six and less than twelve assist features.

18. The semiconductor device of claim 16, wherein the size of each assist feature is between twenty and eighty percent of the size of the non-dense contact.

19. The semiconductor device of claim 16, wherein each assist feature has a shape at least substantially similar to a shape of the non-dense contact.

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20. The semiconductor device of claim 16, wherein the non-dense contact is one or more of: an isolated contact, a random contact, and a semi-dense contact.

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